

POWER ENGINEERING SYSTEMS FACULTY CANDIDATE SEMINAR

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MSEE 112

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Assured Machine Learning for Power Systems

Abstract

Deep penetration of distributed energy resources (DERs) calls for improved monitoring of power systems against reliability and security issues. For example, the low observability in some distribution grids makes monitoring DERs hard due to limited investment and vast coverage of distribution grids. Past methods proposed machine learning models with limited explain ability. However, critical energy infrastructure needs assurance. For such a need, this talk shows how to design assured machine learning for power system monitoring via a twin structure of two learning agents, namely the AI-based and physics-guided models. The twins will collaborate adaptively to minimize the learning error while maximizing physical consistency. The structure ensures good generalization properties of the learned models. We then illustrate how twin models can be used to design cyber-attacks that can bypass chi-squared test on bad data without the system information and discuss how to monitor and mitigate such attacks. Finally, we will demonstrate how the proposed methods are validated using our utility-connected hardware-in-the-loop microgrid.

Biography

Yang Weng received Ph.D. in Electrical and Computer Engineering from Carnegie Mellon University (CMU). Upon graduation, he joined Stanford University as a Postdoctoral Fellow at the Precourt Institute for Energy. He is currently an Assistant Professor in the School of Electrical, Computer, and Energy Engineering at Arizona State University (ASU). He is the consortium chair for *Energy Cyber*, a joint center established by the US Department of Energy and the Israel Ministry of Energy. Yang's research interests are power systems, data science, and cybersecurity. Yang received the NSF CAREER Award, AFOSR YIP Finalist Award, Amazon Research Award, Outstanding IEEE Young Professional Award, Outstanding Faculty Mentor Award, and Centennial Award for Teaching. Yang also received 9 Best Paper Awards, the Winner Award for International Competition on Innovation and Entrepreneurship, and the 2nd Place in Accuracy/1st Place in Speed for the RTE International Competition on "Learning to Run a Power Network" in 2019. His work is also recognized by ABB Fellowship, Stanford Tomcat Fellowship, and CMU Dean's Fellowship.

Host: Scott Sudhoff ~ sudhoff@purdue.edu